MISSOURI OIL AND GAS COUNCIL

Form OGC - 3

**APPLICATION FOR PERMIT TO DRILL, DEEPEN OR PLUG BACK**

APPLICATION TO DRILL ☒ DEEPEN ☐ PLUG BACK ☐

NAME OF COMPANY OR OPERATOR DNR - Geol Survey DATE Sept 77

Box 250 (Address) Rolla (City) Mo (State)

## DESCRIPTION OF WELL AND LEASE

| Name of lease | Well number | Elevation (ground) |
|---|---|---|
| ERDA-TS | 40 | 938 |

WELL LOCATION (give footage from section lines)

18 ft. from (N) (S) sec. line 711 ft. from (E) (W) sec. line

WELL LOCATION Section 28 Township 31N Range 33W County Barton

Nearest distance from proposed location to property or lease line: NH feet

Distance from proposed location to nearest drilling, completed or applied – for well on the same lease: _____ feet

| Proposed depth: | Rotary or Cable tools | Approx. date work will start |
|---|---|---|
| 200 | Rotary (Air) | |

Number of acres in lease: NH

Number of wells on lease, including this well, completed in or drilling to this reservoir: _____

Number of abandoned wells on lease: _____

If lease, purchased with one or more wells drilled, from whom purchased: Name _____ Address NH

No. of Wells: producing _____ inactive _____ abandoned _____

Status of Bond NH

Single Well ☐ Amt. _____ Blanket Bond ☐ Amt. _____ ☐ ON FILE ☐ ATTACHED

Remarks: (If this is an application to deepen or plug back, briefly describe work to be done, giving present producing zone and expected new producing zone) use back of form if needed.

Strat Test

| Proposed casing program: amt. | size | wt./ft. | cem. | Approved casing – To be filled in by State Geologist amt. | size | wt./ft. | cem. |
|---|---|---|---|---|---|---|---|
| | | None | | | | | |

I, the undersigned, state that I am the _____ of the _____ (company), and that I am authorized by said company to make this report; and that this report was prepared under my supervision and direction and that the facts stated therein are true, correct and complete to the best of my knowledge.

Signature _____

Permit Number: 20032

Approval Date: Sept 1977

Approved By: Wallace Bloom

☒ SAMPLES REQUIRED

☐ SAMPLES NOT REQUIRED

WATER SAMPLES REQUIRED @:

_____

_____

Note: This Permit not transferable to any other person or to any other location.

**Remit two copies to: Missouri Oil and Gas Council P.O. Box 250 Rolla, Mo. 65401**

**One will be returned.**

Approval of this permit by the Oil and Gas Council does not constitute endorsement of the geologic merits of the proposed well nor endorsement of the qualifications of the permittee.

MISSOURI OIL AND GAS COUNCIL

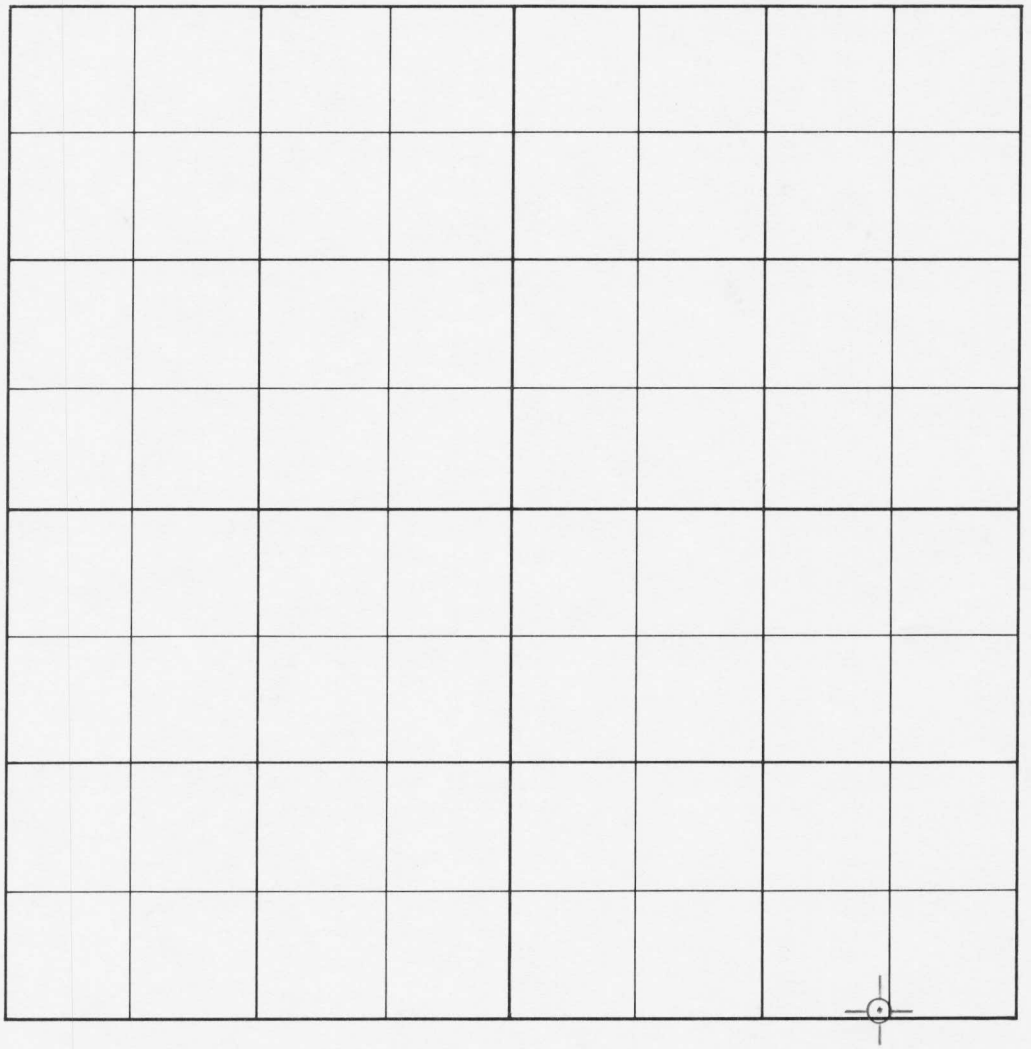
WELL LOCATION PLAT

Form OGC - 4

Owner: DNR-Geol Survey

Lease Name: ERDA-TS NO. 40 County, Barton

18 feet from (N) - (S) line and 711 feet from (E) - (W) line of Sec. 28 Twp. 31N Range 33W



SCALE
1" = 1000'

REMARKS: _____

INSTRUCTIONS

On the above plat, show distance of the proposed well from the two nearest lease and section lines, and from the nearest well on the same lease completed in or drilling to the same reservoir. If the location requested is not in conformance with the applicable well-spacing rules, show all off-setting wells to the proposed well. Do not confuse survey lines with lease lines. See rule 7 - 3 (b) for survey requirements.

(SEAL)

**Remit two copies to: Missouri Oil and Gas Council**
**P.O. Box 250 Rolla, Mo. 65401**
**One will be returned.**

_____

**Registered Land Surveyor**

# TEST BORING LOG

Project E. R. D. A. Boring No. 40 Sheet 1 of 4

Sec. 28, T. 31N., R. 33W. Surface Elevation 938' Offset

Address Date Started 10/24/77 Completed

City & State Driller Rig

Abbreviations: A.O. – Auger Only R.B. – Rock Bit C.W. – Core Water
H.A. – Hollow Auger S.S. – Split Spoon C.A. – Core Air
W.B. – Wash Bore S.T. – Shelby Tube F.B. – Finger Bit

| DEPTH FROM | DEPTH TO | METHOD | PENETRATION RECORD: POCKET PENETRO-METER | PENETRATION RECORD: NO. OF BLOWS | CORE RECOVERY | SAMPLE DESCRIPTION: COLOR–MATERIAL–MOISTURE–CLAY CONSISTENCY SAND DENSITY |
|---|---|---|---|---|---|---|
| 0.0' | 5.0' | WB | | | | Brown very silty clay, moist, stiff |
| 5.0' | 10.0' | WB | | | | Brown & gray silty clay, moist, very stiff |
| 10.0' | 12.0' | WB | | | | Brown & gray clayey weathered shale, soft |
| 12.0' | 15.6' | WB | | | | Brown gray clayey weathered shale, med. hard |
| 15.6' | 15.8' | WB | | | | Black dead oil clay |
| 15.8' | 17.5' | WB | | | | Brown & gray weathered shale, med. hard |
| 17.5' | 21.0' | WB | | | | White sandy shale, med. hard |
| 21.0' | 22.6' | CW1 | | | 1.6' | Same 7 pcs. |
| 22.6' | 25.7' | CW1 | | | 3.1' | Brown sandy shale, 7 pcs. |
| 25.7' | 28.6' | CW1 | | | 2.9' | Light gray shale w/sand lens 7 pcs. |
| 28.6' | 31.0' | CW1 | | | 2.4' | Gray shale, hard 8 pcs. |
| 31.0' | 38.6' | CW2 | | | 7.6' | Same 18 pcs. |
| 38.6' | 39.7' | CW2 | | | 1.1' | Light gray shale, med. hard 4 pcs. |
| 39.7' | 41.0' | CW2 | | | 1.3' | Light gray sandstone, 3 pcs. |
| 41.0' | 50.5' | CW3 | | | 9.5' | Same 7 pcs. |
| 50.5' | 51.0' | CW3 | | | 0.5' | Gray silty shale, hard 2 pcs. |

REMARKS: (Casing, Water Loss, Etc.) Water Level Time Date

(Completion)

Layne-Western Company, Inc. 1010 WEST 39th STREET, KANSAS CITY, MISSOURI 64111

# TEST BORING LOG

Project E. R. D. A. Boring No. 40 Sheet 2 of 4

Surface Elevation _____ Offset _____

Address _____ Date Started _____ Completed _____

City & State _____ Driller _____ Rig _____

Abbreviations: A.O. – Auger Only; H.A. – Hollow Auger; W.B. – Wash Bore; R.B. – Rock Bit; S.S. – Split Spoon; S.T. – Shelby Tube; C.W. – Core Water; C.A. – Core Air; F.B. – Finger Bit

| DEPTH FROM | DEPTH TO | METHOD | PENETRATION RECORD: POCKET PENETRO-METER | PENETRATION RECORD: NO. OF BLOWS | CORE RECOVERY | SAMPLE DESCRIPTION: COLOR–MATERIAL–MOISTURE–CLAY CONSISTENCY SAND DENSITY |
|---|---|---|---|---|---|---|
| 51.0' | 52.9' | CW4 | | | 1.9' | Gray silty shale, hard 6 pcs. |
| 52.9' | 54.0' | CW4 | | | 1.1' | Gray sandstone, 4 pcs. |
| 54.0' | 54.7' | CW4 | | | 0.7' | Black coal, 4 pieces |
| 54.7' | 56.7' | CW4 | | | 2.0' | Gray shale, med. hard to soft 7 pcs. |
| 56.7' | 61.0' | CW4 | | | 4.3' | Dark gray shale w/soft seams, hard 16 pcs. |
| 61.0' | 61.5' | CW5 | | | 0.5' | Same 6 pcs. |
| 61.5' | 62.8' | CW5 | | | 1.3' | Black coal 4 pcs. |
| 62.8' | 65.9' | CW5 | | | 3.1' | Gray shale, med. hard 8 pcs. |
| 65.9' | 69.0' | CW5 | | | 3.1' | DArk gray shale, hard 9 pcs. |
| 69.0' | 70.6' | CW5 | | | 1.6' | Black coal 10 pieces |
| 70.6' | 71.0' | CW5 | | | 0.4' | Gray shale, med. hard 2 pieces |
| 71.0' | 73.0' | CW6 | | | 2.0' | Gray shale, hard 5 pieces |
| 73.0' | 81.0' | CW6 | | | 8.0' | Dark gray shale, w/sand lens 8 pcs. |
| 81.0' | 81.8' | CW7 | | | 0.2' | Black coal 2 pcs. |
| 81.8' | 86.1' | CW7 | | | 4.3' | Gray siltstone 6 pcs. |
| 86.1' | 91.0' | CW7 | | | 5.5' | Sandstone |

REMARKS: (Casing, Water Loss, Etc.) Water Level Time Date

_____ _____ _____ _____ (Completion)

_____ _____ _____ _____

Layne-Western Company, Inc. 1010 WEST 39th STREET, KANSAS CITY, MISSOURI 64111

# TEST BORING LOG

Project E. R. D. A. Boring No. 40 Sheet 3 of 4

Surface Elevation _____ Offset _____

Address _____ Date Started _____ Completed _____

City & State _____ Driller _____ Rig _____

Abbreviations: A.O. – Auger Only R.B. – Rock Bit C.W. – Core Water
H.A. – Hollow Auger S.S. – Split Spoon C.A. – Core Air
W.B. – Wash Bore S.T. – Shelby Tube F.B. – Finger Bit

| DEPTH FROM | DEPTH TO | METHOD | PENETRATION RECORD: POCKET PENETRO-METER | PENETRATION RECORD: NO. OF BLOWS | CORE RECOVERY | SAMPLE DESCRIPTION: COLOR–MATERIAL–MOISTURE–CLAY CONSISTENCY SAND DENSITY |
|---|---|---|---|---|---|---|
| 91.0' | 100.0' | CW8 | | | 9.0' | Gray sandstone, 10 pcs. |
| 100.0' | 101.0' | CW8 | | | 1.0' | Gray siltstone 2 pieces |
| 101.0' | 104.6' | CW9 | | | 3.6' | Same 7 pcs. |
| 104.6' | 111.0' | CW9 | | | 4.5' | Gray sandstone 14 pcs. |
| 111.0' | 116.8' | CW10 | | | 0 | Gray sandstone 17 pcs. |
| 116.8' | 120.2' | CW10 | | | 3.4' | Gray shale, 10 pcs. |
| 120.2' | 121.0' | CW10 | | | 0.8' | Black coal, 3 pieces |
| 121.0' | 125.0' | CW11 | | | 4.0' | Gray siltstone 7 pcs. |
| 125.0' | 131.0' | CW11 | | | 6.0' | Dark gray shale w/sand lens 16 pcs. |
| 131.0' | 135.7' | CW12 | | | 4.7' | Same 8 pcs. |
| 135.7' | 136.3' | CW12 | | | 0.6' | Black coal 3 pieces |
| 136.3' | 141.0' | CW12 | | | 4.7' | Gray silty shale, hard 8 pcs. |
| 141.0' | 151.0' | CW13 | | | 10.0' | Same 17 pcs. |
| 151.0' | 153.7' | CW14 | | | 2.7' | Same 3 pcs. |
| 153.7' | 154.5' | CW14 | | | 0.8' | Black coal, 4 pcs. |
| 154.5' | 161.0' | CW14 | | | 6.5' | Gray siltstone 7 pcs. |

REMARKS: (Casing, Water Loss, Etc.) Water Level Time Date

_____ _____ _____ _____ (Completion)

_____ _____ _____ _____

# TEST BORING LOG

Project E. R. D. A. | Boring No. 40 | Sheet 4 of 4

Surface Elevation _____ | Offset _____

Address _____ | Date Started _____ | Completed 10/26/77

City & State _____ | Driller _____ | Rig _____

Abbreviations: A.O. – Auger Only; H.A. – Hollow Auger; W.B. – Wash Bore; R.B. – Rock Bit; S.S. – Split Spoon; S.T. – Shelby Tube; C.W. – Core Water; C.A. – Core Air; F.B. – Finger Bit

| DEPTH FROM | DEPTH TO | METHOD | PENETRATION RECORD: POCKET PENETROMETER | PENETRATION RECORD: NO. OF BLOWS | CORE RECOVERY | SAMPLE DESCRIPTION: COLOR–MATERIAL–MOISTURE–CLAY CONSISTENCY SAND DENSITY |
|---|---|---|---|---|---|---|
| 161.0' | 161.7' | CW15 | | | 0.7' | Gray siltstone 2 pcs. |
| 161.7' | 166.8' | CW15 | | | 5.1' | Gray sandstone w/trace oil 6 pcs. |
| 166.8' | 169.9' | CW15 | | | 3.1' | Black sandstone w/oil . 8 pcs. |
| 169.9' | 171.0' | CW15 | | | 1.1' | Dark gray shale w/lens 3 pcs. |
| 171.0' | 173.2' | CW16 | | | 2.2' | Same 5 pcs. |
| 173.2' | 174.6' | CW16 | | | 1.4' | Black coal 12 pcs. |
| 174.6' | 176.1' | CW16 | | | 1.5' | Gray shale, med. hard 8 pcs. |
| 176.1 ' | 181.0' | CW16 | | | 4.9' | DArk gray shale, hard 6 pcs. |
| 181.0' | 187.1' | CW12 | | | 6.1' | Same 16 pcs. |
| 187.1' | 190.8' | CW12 | | | 3.7' | Green shale w/chert seams 9 pcs. |
| 190.8' | Total | depth | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

REMARKS: (Casing, Water Loss, Etc.) Water Level Time Date

_____ _____ _____ _____ (Completion)

_____ _____ _____ _____

Layne-Western Company, Inc. 1010 WEST 39th STREET, KANSAS CITY, MISSOURI 64111

DNR-ERDA Tar Sands Core No. 4

QUADRANGLE: Pittsburg 15' Quad.

COUNTY: Barton

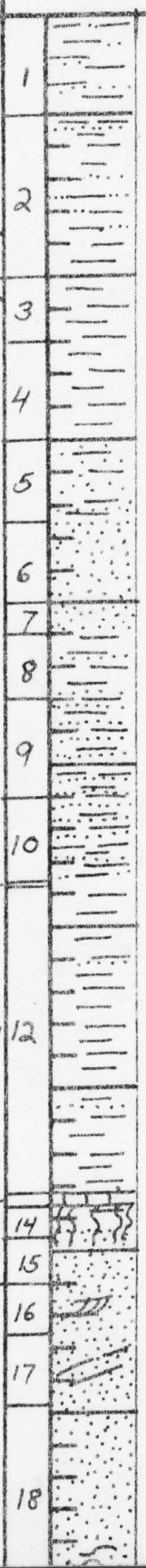
LOCATION: NE1/4 NE1/4 NW1/4 NE1/4 NE1/4 SEC. 28 T.31N. R.33W.
18 FNL, 711 FEL

DATE: spudded 10/24
logged 11/6/7

LOCATION DESCRIPTION: 1-1/2 miles east and 4 miles south of Mindenmines

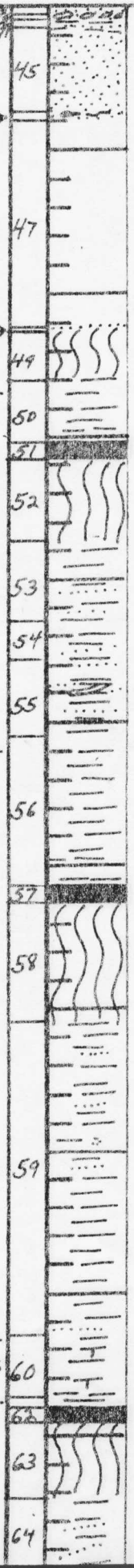
938.0 ft. elev. H.L.

| DEPTH FROM | DEPTH TO | BED NO. | LITHOLOGY |
|---|---|---|---|
| 0.0 | 5.0 | 1 | clay, brown, silty |
| 5.0 | 10.0 | 2 | clay, brown, and silty gray clay |
| 10.0 | 12.0 | 3 | shale, brown, soft |
| 12.0 | 15.0 | 4 | shale, brown, zones of gray, firm |
| 15.0 | 17.5 | 5 | shale, brown and gray, sandy; .01 ft. "dead" oil zone at 15.5 ft. |
| 17.5 | 20.0 | 6 | ss., gray, zones of brown, fine grained, soft |
| 20.0 | 21.0 | 7 | ss., lt. gray, zones of brown, soft<br>Rock chip samples with finger bit to 21.0 ft. |
| 21.0 | 23.0 | 8 | shale, lt. gray, non calc., silty to sandy, weathered dk. yellowish orange (10YR 6/6) along bedding planes |
| 23.0 | 26.0 | 9 | shale and ss. interlaminated, weathered grayish orange (10YR 7/4), micaceous |
| 26.0 | 28.6 | 10 | ss, lt. gray fine grained, ripple laminated; interlaminated with med. gray shale in equal amounts; fine sand sized siderite concretions near middle |
| 28.6 | 28.65 | 11 | clay ironstone zone, reddish brown |
| 28.65 | 38.2 | 12 | shale, med. gray at top to dk. gray at bottom (dry); approx. 1% lt. gray lenticular ss. laminae dispersed throughout unit; .05 ft. thick tan clay-ironstone beds and concretions at 35.6, 36.5, 37.2, 37.5 ft. |
| 38.2 | 38.6 | 13 | ls., dk. gray (wet) thin bedded, hard, fossils of small productids, biconvex brachiopods Composita?, high spired gastropods; predominately thin shells of calcite, many shells pyritized |
| 38.6 | 39.7 | 14 | underclay, med. lt. gray, carbonized, stems, fern fronds and roots? |
| 39.7 | 41.0 | 15 | ss., lt. gray, fine grained, quartzose, upper .5 ft. with carbonized roots |
| 41.0 | 42.8 | 16 | ss., lt. gray with brownish tinge, cross bedded; small black specks of gilsonite and/or coal |
| 42.8 | 44.8 | 17 | ss., lt. gray with tan tinge approx. 10% of unit is high angle (45°) black smutty coaly laminae, micaceous, pyritiferous |
| 44.8 | 50.4 | 18 | ss., lt. brownish gray, cross-bedded, specks of gilsonite and/or coal; few distorted paper thin coaly laminae below 49.0 ft. |



| | | | |
|---|---|---|---|
| 50.4 | 52.7 | 19 | shale, med. gray; sharp contact with overlying unit; grades into ss. at bottom |
| 52.7 | 53.95 | 20 | ss., lt.gray, micaceous, interlaminated with med. gray shale from 53.5-53.7 ft. with bioturbite appearance; elongated to lense shaped coal clasts near bottom; irregular scour surface contact with underlying coal |
| 53.95 | 54.7 | 21 | coal, banded bright and dull, pyritized plant material and nodules forms approx. 2% of unit |
| 54.7 | 57.0 | 22 | underclay, med. dk. gray, soft, carbonized roots; clusters of sand-sized siderite concretions near bottom |
| 57.0 | 57.8 | 23 | shale, med. dk. gray to dk. gray at bottom |
| 57.8 | 61.4 | 24 | shale, dk. gray (dry), tan clayironstone zones about .05 ft. thick at 58.1, 58.4, 58.8, 59.0, 59.4 ft; pyritized bits of plants |
| 61.4 | 62.7 | 25 | coal, bright, dull bands of fusain; pyritized plant fragments; cleats filled with calcite |
| 62.7 | 64.2 | 26 | underclay, med. gray, carbonized roots |
| 64.2 | 64.4 | 27 | shale with clusters of sand sized siderite concretions, some pyritized |
| 64.4 | 69.0 | 28 | shale, med. gray at top grading downsection into dk. grayish black (dry) at bottom; non calc., approx. 5% of unit is evenly spaced lt. gray lenticular ss. laminae from 68.0-68.5 ft; .01 ft. thick tan clay ironstone beds at 67.5 and 68.0 ft. |
| 69.0 | 70.5 | 29 | coal, .05 ft. thick hard dk.gray clay parting at 70.2 ft; bright; paper thin lenses of pyritized plant material throughout unit; cleats filled with calcite |
| 70.5 | 73.0 | 30 | underclay, med. gray, carbonized roots; clusters of sand-sized siderite concretions form vertical patches .05 wide and .2 ft. long in bottom half of unit |
| 73.0 | 74.3 | 31 | shale, med gray, lt.gray paper thin distorted silty ss. laminae form approx. 30% of unit; bioturbite appearance; microfaulted slump? structure |
| 74.3 | 81.9 | 32 | shale, dk. gray (wet) approx. 30% of unit is lt. gray fine grained lenticular ss. laminae (starved ripples); horizontal, evenly spaced; many ripples have "salt and pepper" appearance resulting from bits of coaly material; top 1 ft. with clusters of sand sized siderite concretions; non calc. |
| 81.9 | 82.05 | 33 | coal, bright, cleats filled with white calcite |
| 82.05 | 84.8 | 34 | underclay, med. gray carbonized and pyritized roots; very sandy at bottom |
| 84.8 | 86.3 | 35 | ss, lt. gray, approx. 20% of unit is med. gray shale laminae; ss. structures range from horizontal laminae to lenticular cross-laminae and pods, slump and scour fill |
| 86.3 | 89.3 | 36 | ss., lt. gray, fine grained, mica, bits of coaly material in ss. form sporadic thin zones |
| 89.3 | 90.9 | 37 | ss., lt. gray, distorted flame (slumpage?) structures apparent in dk. gray shale intervals which comprise approx. 20% of unit |
| 90.9 | 96.2 | 38 | ss., lt. gray, fine grained, mica and coaly material along bedding planes; distorted flame structure sporadically located in shaly intervals, form less than 5% of unit |

| | | | |
|---|---|---|---|
| 96.2 | 100.1 | 39 | ss., lt. gray; fine grained, silty, structures accentuated in shale intervals which form about 5% of unit and include cross laminated ripples, flame structures, slumpage and compressional structures |
| 100.1 | 101.0 | 40 | shale, approx. 5% of unit is pods of lt. gray ss. |
| 101.0 | 104.6 | 41 | shale, med. gray and ss. lt. gray, fine grained intercalated; lenticular cross ripples, load cast-like pods of ss. in shale; flame structures; conglomeratic with tan clasts of woody material and fragmented shale bed from 103.8-103.85; sand matrix grain size 1/16 to 1/8 mm dia. |
| 104.6 | 105.3 | 42 | ss., lt. gray, fine grained micaceous |
| 105.3 | 105.4 | 43 | conglomerate, clasts of tan woody material, coal, pyritized wood, tan shale to .1 ft long and .05 ft. thick; matrix of fine grained quartzose ss |
| 105.4 | 105.8 | 44 | ss, lt. gray and shale med. gray, interlaminated, mica, bits coaly material, horizontal to cross laminated |
| 105.8 | 108.9 | 45 | ss., lt. gray fine grained, cross bedded to massive |
| 108.9 | 109.0 | 46 | conglomerate, blades and crinkly lenses of coal, fusain; lt. gray fine grained (1/16-1/8 mm dia grains) quartzose ss. matrix; micaceous |
| 109.0 | 116.6 | 47 | lost core |
| 116.6 | 116.7 | 48 | ss, lt. gray, fine grained, few bits coal (possibly out of place) |
| 116.7 | 118.0 | 49 | underclay, med. gray, slickensided, carbonized roots |
| 118.0 | 120.25 | 50 | shale, med. gray at top with sand sized siderite concretions becoming mottled dk. gray to uniformly dk. gray at bottom |
| 120.25 | 120.95 | 51 | coal, bright, pyritized plant material; cleats filled with calcite |
| 120.95 | 123.8 | 52 | underclay, med. gray, carbonized roots, slickensided; bottom half with clusters of sand sized siderite concretions |
| 123.8 | 126.5 | 53 | shale, med. gray at top to grayish black (dry) at bottom, approx. 5% of unit below 125.0 ft. is evenly spaced lt. gray lenticular, horizontal ss. laminae; clusters of tan sand sized siderite concretions in bottom 1 ft. |
| 126.5 | 127.9 | 54 | shale, black, approx. 5% of unit is evenly spaced lt. gray lenticular ss. laminae |
| 127.9 | 130.4 | 55 | ss., lt. gray fine grained, small scale cross-bedding to cross laminated ripples; intercalated with grayish black shale; wavy; ss. decreases downsection |
| 130.4 | 135.8 | 56 | shale, dk. gray to grayish black, clayironstone bed 135.4-135.5 ft. |
| 135.8 | 136.3 | 57 | coal, bright with bands of dull fusain, pyrite; cleats filled with calcite |
| 136.3 | 140.5 | 58 | underclay, med. gray, bottom few inches dk. gray, carbonized roots throughout unit; sand sized siderite concretions below 137.5 ft forming clusters or concretions in bottom 2 ft. |
| 140.5 | 151.6 | 59 | shale, dk. gray (N3, dry) to black (N1, wet); approx. 2% of unit is lt. gray paper thin lenticular ss. laminae and pods from 141.0-146.5 and below 151.2 ft; tan clay ironstone zones 142.6-142.7, 144.1-144.2, 147.2-147.25, 148.7-148.9 ft; small nodules pyrite 141.5-145.8 ft. |



| | | | |
|---|---|---|---|
| 151.6 | 153.8 | 60 | shale, dk. gray (dry) to black (wet) very fossiliferous with recrystallized fragments predominately arched thin shells (productids); abundantly fossiliferous areas occur as pods or tubular structures possibly filled in burrows, mostly shale from 152.7-153.0 ft. |
| 153.8 | 154.0 | 61 | shale, black, hard, non calc. |
| 154.0 | 154.6 | 62 | coal, bright, cleats filled with calcite |
| 154.6 | 157.2 | 63 | underclay, dk. gray, very sandy, carbonized roots; sand sized siderite concretions in bottom few inches |
| 157.2 | 161.7 | 64 | shale, med. gray, approx. 10% of unit lt. gray ripple ss. laminae evenly spaced, inclined |
| 161.7 | 166.8 | 65 | ss., lt. gray approx 20% of unit is dk. gray inclined shale laminae, selected thick ss. beds stained brown with asphalt comprises 40% of unit; contorted wavy structure, some possibly caused by compaction of clay |
| 166.8 | 169.9 | 66 | ss., saturated with brownish black asphalt; few dk. gray, micaceous shale laminae and wavy paper thin laminae of coal material in bottom half; conglomeratic with flattened tan woody clasts and dk. gray shale from 167.0-167.4 ft; ss. grain size 1/16 to 1/8 mm. |
| 169.9 | 173.2 | 67 | shale, med. gray at top to black (wet) at bottom; sharp contact with overlying unit; pyritized clayironstone nodules .05 ft. dia. at base overlying coal |
| 173.2 | 174.6 | 68 | coal, bright, pyritized compressed leaves, twigs, etc. form paper thin lenses; cleats filled with calcite |
| 174.6 | 175.8 | 69 | underclay, med. gray, few carbonized roots; soft |
| 175.8 | 187.1 | 70 | shale, black slickensided, tan clay ironstone bed 178.6-178.8; 1 or 2% of unit is paper thin lt. gray ss. lenses from 176.5-179.8 ft. |
| 187.1 | 188.0 | 71 | breccia, chert clasts angular to subangular to .2 ft. in largest dimension; black shale matrix; color of chert ranges from lt. gray, green to pink, porous in places and saturated with brownish-black asphalt |
| 188.0 | 189.6 | 72 | breccia, predom. lt. gray to greenish gray clay with approx 20% chert clasts to .2 ft dia. concentrated near bottom; few elongated black shale clasts in upper .5 ft |
| 189.6 | 190.1 | 73 | chert, lt. gray to bluish gray, approx. 50% of unit is vuggy, porous and saturated with brownish black asphalt |
| 190.1 | 190.8 | 74 | clay, greenish gray (5GY 6/1) slickensided; clast of tan fine grained ls. at top .1 ft in largest dimension, pyrite |

T. D. 190.8 ft.